

## WHAT IS CLAIMED IS:

1. A static induction transistor comprising:
  - a semiconductor substrate with an energy band gap greater than that of silicon, having
  - a first semiconductor region of a first conduction type,
  - a second semiconductor region of a first conduction type, positioned on the surface of said first semiconductor region and having an impurity concentration higher than that of said first semiconductor region,
  - a first gate region of a second conduction type positioned on the surface of said first semiconductor region, and
  - a second gate region of a second conduction type, including a projection of said second semiconductor region and partially including a projection of said first gate region within said first semiconductor region;
  - a drain electrode connected electrically to said first semiconductor region;
  - a source electrode connected electrically to said second semiconductor region; and
  - a gate electrode connected electrically to said first gate region;characterized in that said second semiconductor region and said first gate region are in contact with each other on the surface of said first semiconductor region.
2. A static induction transistor as set forth in claim 1, wherein at the blocking state of the static induction transistor, the potential of the second gate

region is in a floating state, or at the same potential as that of said second semiconductor region or the same potential as that of said first gate region.

3. A static induction transistor as set forth in claim 1, wherein the length of a part, in said second gate region, overlapping the projection of said second semiconductor region is larger than the width of a part of said first semiconductor region disposed between said first gate region and said second gate region.

4. A static induction transistor as set forth in claim 1, wherein said first gate region has a first part in contact with said second semiconductor region, and a second part having an impurity concentration higher than that of said first part and is in contact with said gate electrode.

5. A static induction transistor as set forth in claim 1, further comprising an embedded region of a second conduction type separated from said second gate region within said first semiconductor region.

6. A static induction transistor as set forth in claim 1, wherein a semiconductor material of said semiconductor substrate is selected among silicon carbide, diamond and gallium nitride.

7. A static induction transistor comprising:  
a semiconductor substrate with an energy band gap greater than that of silicon, having  
a first semiconductor region of a first conduction type,

a second semiconductor region of a first conduction type, positioned on the surface of said first semiconductor region and having an impurity concentration higher than that of said first semiconductor region, and

a gate region of a second conduction type including a projection of said second semiconductor region within said first semiconductor region;

a drain electrode connected electrically to said first semiconductor region;

a source electrode connected electrically to said second semiconductor region; and

a gate electrode connected electrically to the surface of said first semiconductor region;

characterized in that said first semiconductor region and said gate electrode form a Schottky junction.

8. A static induction transistor as set forth in claim 7, wherein a plurality of said second gate regions are coupled with each other by semiconductor layers of a second conduction type.

9. A static induction transistor as set forth in claim 8, wherein said semiconductor layers are extended portions of said second gate regions.

10. A static induction transistor as set forth in claim 8, wherein said semiconductor layer extends through said first gate region and reaches said second gate region.

11. A method of manufacturing a static induction transistor, comprising the steps of:

forming a second gate region of a second conduction type on a surface of a first semiconductor region of a first conduction type of a semiconductor substrate with an energy band gap greater than that of silicon;

growing said first semiconductor region onto said first semiconductor region and said second gate region by an epitaxial method; and

forming a first gate region of a second conduction type onto said first semiconductor region after growing by an epitaxial method.

12. An electric power conversion apparatus in which a static induction transistor is turned on or off and thereby electric power is converted, said static induction transistor comprising:

a semiconductor substrate with an energy band gap greater than that of silicon, having

a first semiconductor region of a first conduction type,

a second semiconductor region of a first conduction type, positioned on the surface of said first semiconductor region and having an impurity concentration higher than that of said first semiconductor region,

a first gate region of a second conduction type positioned on the surface of said first semiconductor region, and

a second gate region of a second conduction type, including a projection of said second semiconductor region and partially including a projection of said first gate region within said first semiconductor region;

a drain electrode connected electrically to said first semiconductor region;

a source electrode connected electrically to said second semiconductor region; and

a gate electrode connected electrically to said first gate region;

characterized in that on the surface of said first semiconductor region, said second semiconductor region and said second semiconductor region are in contact with each other.

13. An electric power conversion apparatus in which a static induction transistor is turned on or off and thereby electric power is converted,

said static induction transistor comprising:

a semiconductor substrate with an energy band gap greater than that of silicon,

having a first semiconductor region of a first conduction type,

a second semiconductor region of a first conduction type, positioned on the surface of said first semiconductor region and having an impurity concentration higher than that of said first semiconductor region, and

a gate region of a second conduction type including a projection of said second semiconductor region within said first semiconductor region;

a drain electrode connected electrically to said first semiconductor region;

a source electrode connected electrically to said second semiconductor region; and

a gate electrode connected electrically to the surface of said first semiconductor region;

characterized in that said first semiconductor region and said gate electrode form a Schottky junction.